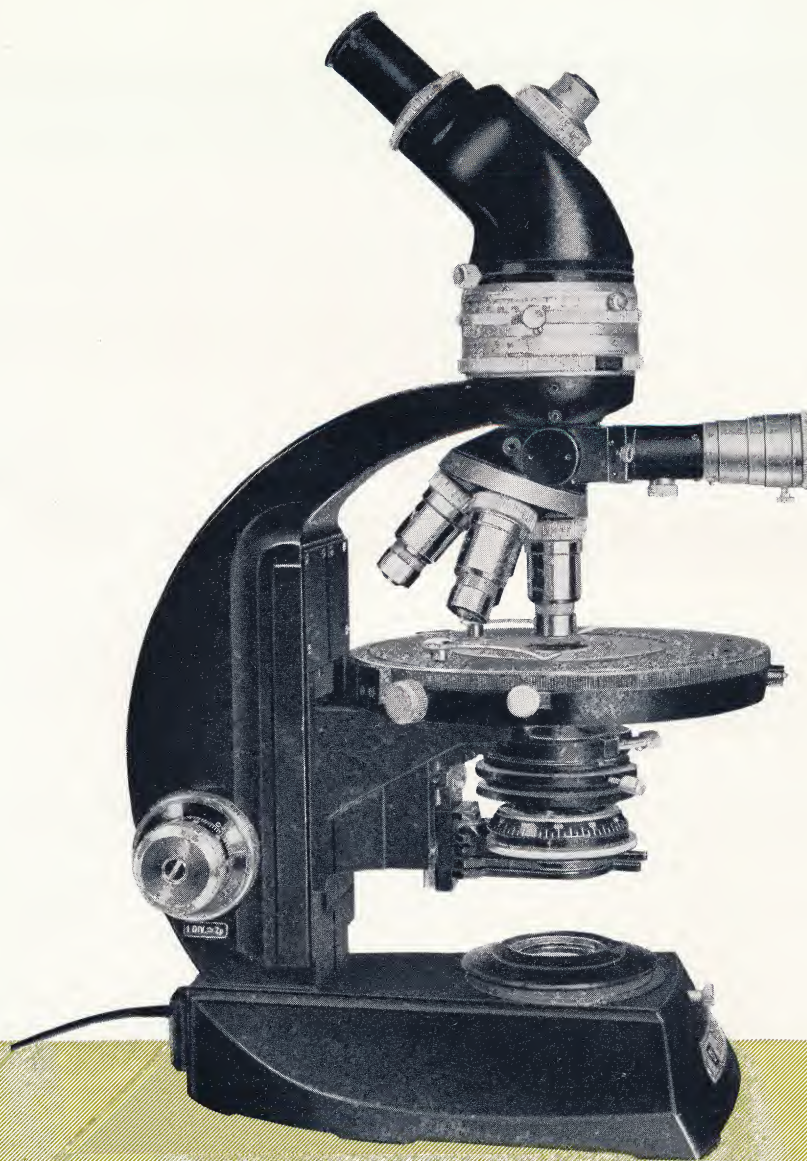


**M72 SERIES POLARIZING MICROSCOPE**



**M72 SERIES  
POLARIZING  
MICROSCOPE**

**VICKERS INSTRUMENTS LTD.**





# M72 SERIES

## POLARIZING MICROSCOPES

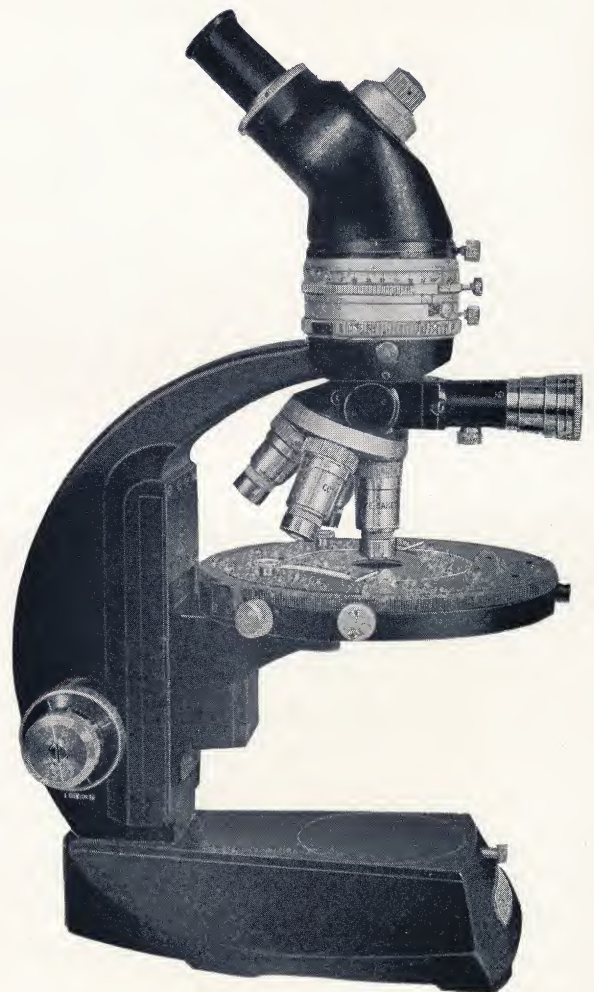
### three basic instruments from a basic stand

The M72 series microscopes have the same limb, base and stage. They form, however, a range of three microscopes, one for transmitted light, one for incident light, and one for transmitted and incident light; each is available in two forms: either with a revolving objective changer, or with a fitting to allow the objective to be mounted on to the microscope in individual centring changers.



**M72 for transmitted light illustrated with:**

M720225	Monocular head	M720100	Analyser unit
M720190	Polarizer unit	M220290	Illuminator



**M73 for incident light illustrated with:**

M720225	Monocular head
M720100	Analyser unit



## three basic stands . . .

Stand **M72** is for transmitted polarizing work. The basic microscope contains all the standard features of the polarizing range of instruments and includes a rack and pinion focusing substage which can be fitted with either of the polarizers shown on page 6. Any of the viewing heads or analysers can be attached.

**M720004** Stand with triple objective changer and simple polarizer.

**M720024** Stand with individual objective changer and simple polarizer.

**M720005** Stand with triple objective changer and advanced polarizer.

**M720025** Stand with individual objective changer and advanced polarizer.

Stand **M73** is for incident polarized light work. It has no substage but has the incident illuminator built on. It can be fitted with any of the viewing heads and analysers.

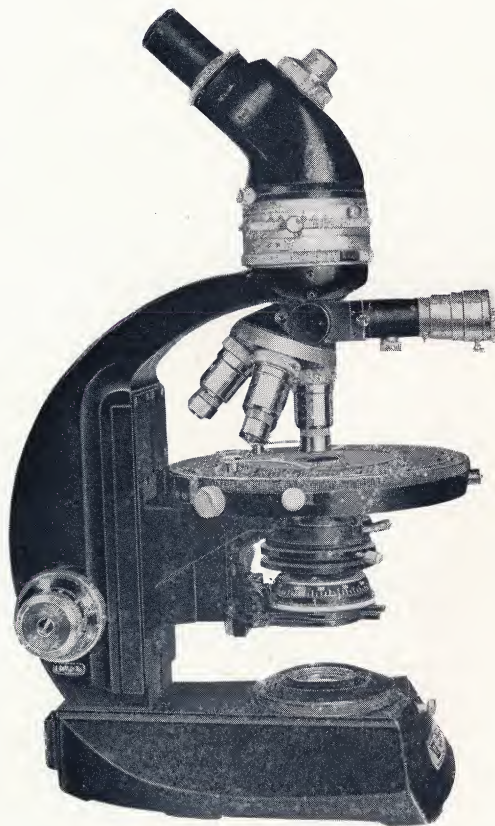
**M730005** Stand with quadruple objective changer.

**M730025** Stand with attachment for individual objective changers.

Stand **M74** is for incident and transmitted polarized light work. It has the rack and pinion substage, the incident illuminator, and the advanced polarizer. It can be fitted with all the available attachments and accessories.

**M740005** Stand with quadruple objective changer.

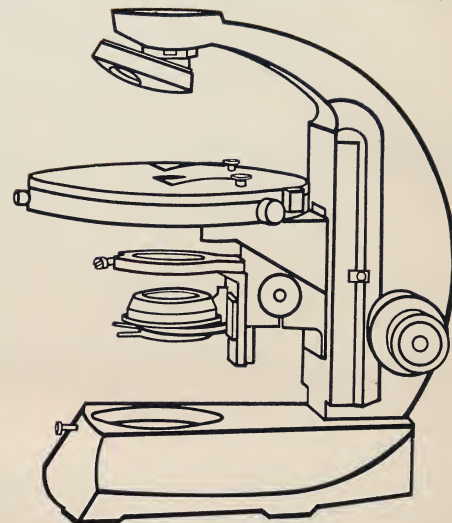
**M740025** Stand with attachment for individual objective changers.



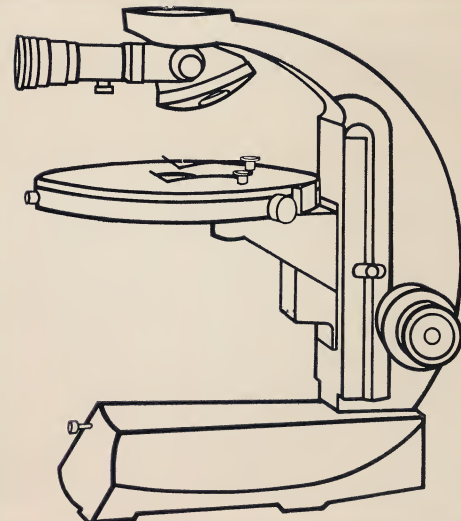
**M74 for incident and transmitted light illustrated with:**

<b>M720225</b> Monocular head	<b>M720190</b> Polarizer unit
<b>M720100</b> Analyser unit	<b>M220290</b> Illuminator

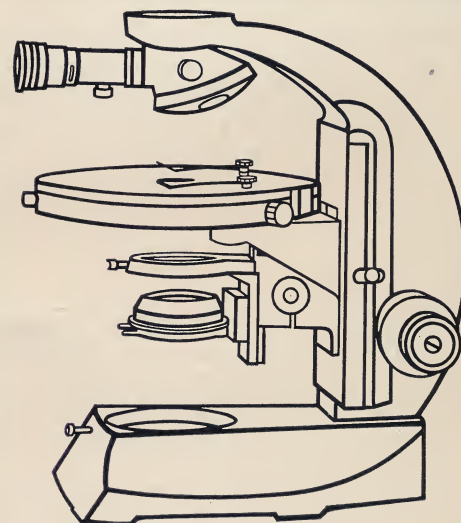
**M72**



**M73**



**M74**



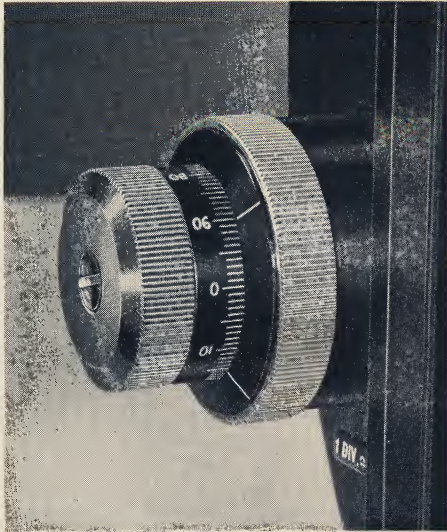




# SPECIAL FEATURES

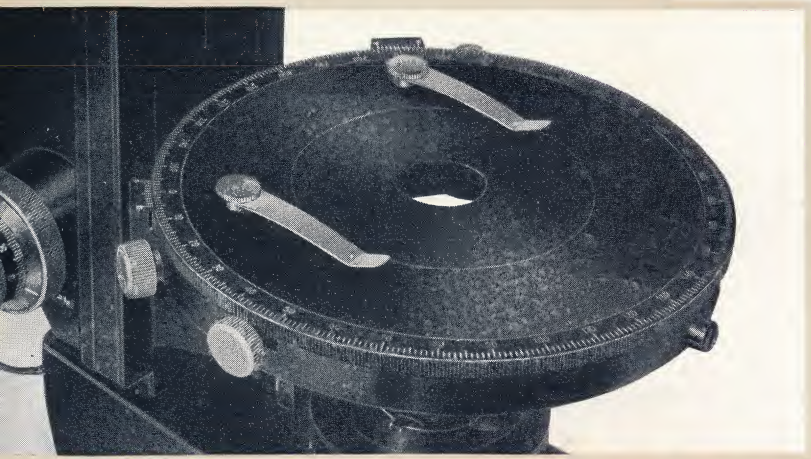
## VICKERS POLARIZING MICROSCOPES

the basic stand and attachments have many new and advanced design features



### COARSE AND FINE FOCUSING

Concentric coarse and fine focusing control knobs are low placed to give a comfortable working position and the very wide ball bearing focusing slides ensure excellent rigidity. Fine adjustment graduated every 2 microns.



### ROTATING STAGE

The optical precision rotating stage is a novel Vickers Instruments design in which the ball tracks are produced by the same method used in the making of lenses, thereby achieving similar precision. This gives a stage with great accuracy of rotation and a very free movement. Two verniers are fitted, reading to 6 minutes of arc. The stage has centring screws and a lock to the rotation. The centre disc removes for the three axis stage to be fitted.

An attachable mechanical stage, M720300, is available for fitting to the rotating stage.



### HEADS AND ANALYSER UNITS

Monocular or binocular heads are easily attached or removed. The range of heads and analyser units which are available, is shown on page 6.



### MONOCULAR HEADS

The Bertrand lens is in the monocular head. Rotation of the knob swings the lens in or out and a stop is incorporated to isolate the conoscopic figure from small particles.

An alternative monocular head has a focusing Bertrand lens. The lens is swung in or out by rotation of the larger knob and focused by the smaller concentric knob.



Details of the following publications are available from Vickers Instruments:

"MANUAL OF THE POLARIZING MICROSCOPE" by A. F. Hallimond, M.A., Sc.D.

"NEW BRITISH POLARIZING MICROSCOPE" by A. F. Hallimond, M.A., Sc.D. and B. O. Payne, M.Sc.

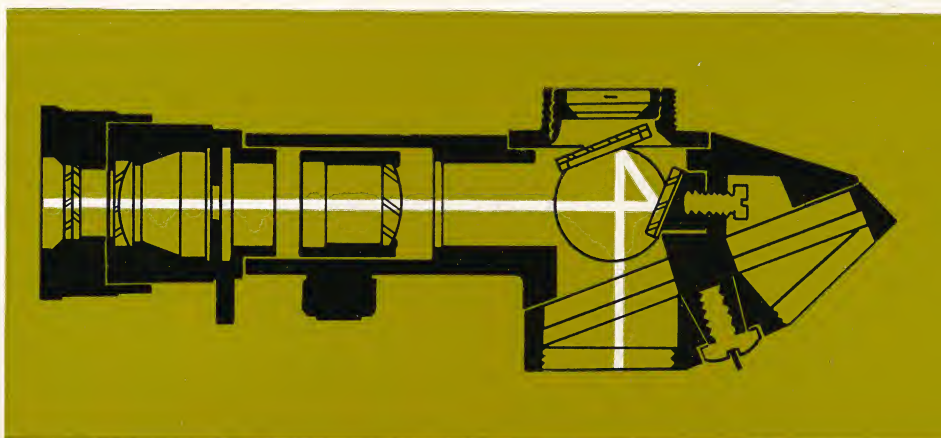
"CRYSTAL OPTICS" by C. E. Marshall, D.Sc., Ph.D.

"MICROSCOPE DESIGN & CONSTRUCTION" by B. O. Payne, M.Sc.

### INCIDENT ILLUMINATOR

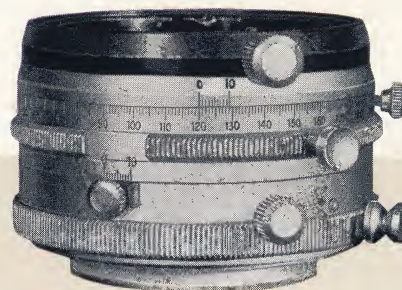
The incident illuminator\* is a considerable advance on earlier designs. The light entering the illuminator is reflected by a mirror so that it falls on to the thin glass reflector at a much reduced angle, thus minimising the rotation effects on reflection. The result is a more uniformly polarized field and aperture than is commonly obtained in incident polarized light microscopy.

\* Provisional Patent No. 44100/61.



### ANALYSER UNIT

The more advanced analyser has the unusual feature that the analyser can be rotated together with the compensator slot, or each can be rotated separately, which allows great flexibility in the use of compensators. All polarizing elements used in Vickers Instruments polarizing microscopes employ top grade high extinction polarizing film, mounted between specially selected plates of strain free optical glass and edge-sealed against moisture.





# ACCESSORIES

## VICKERS POLARIZING MICROSCOPES

### HEADS

The following viewing heads are available. M720227 for normal tube eyepiece and M720228 for wide tube eyepiece, are monocular heads having a swing-out non-focusing Bertrand lens. M720225 for normal tube eyepiece and M720226 for wide tube eyepiece, are monocular heads having a focusing swing-out Bertrand lens. M720270 is a binocular head for normal tube eyepieces. M720380 is a photovisual head with swing-out non-focusing Bertrand lens in which the light can be directed up the 30° viewing tube, or vertically through to a camera by withdrawing the Bertrand lens and reflecting prism from the light path, the tube length and magnification remaining unchanged.

### INDIVIDUAL OBJECTIVE CHANGERS

Instead of revolving objective changers the microscope can be supplied with individual objective changers. A receiving unit is attached to the microscope and each objective is screwed permanently into an individual changer which has centring screws to bring the objectives exactly paracentral with each other. The objectives, on their individual changers, can then be clipped on to the microscope. The changer is shown fitted to the incident illuminator and reflector unit.

### ANALYSER UNITS

The simple Analyser M720135 has a non-rotating pull-out analyser and a 45° slot for compensators.

The advanced Analyser M720100 has a rotating pull-out analyser, the rotational position of which can be read by vernier to 6 minutes of arc, and clamped. It also has a rotating compensator slot, the position of which can be read to 6 minutes of arc and clamped. If required the two can be clamped and rotated together, a feature which can be useful for some compensating techniques.

### POLARIZER UNITS

Two polarizer units are available. M720170 has a simple swing-out polarizer which rotates through 90° and is ungraduated. M720190 has a swing-out polarizer graduated every 5° with a click stop every 90°. Both polarizing units have a subsidiary lens in a trip-out mount for use with low power objectives, and also a swing-out filter holder and ground glass screen.

### ILLUMINATION

The transmitted light microscopes can be illuminated by a plano and concave mirror in a gymbal, M220325, or by the high intensity light M220290. This has a 6 v. 15 w. lamp in the microscope base, a lens and diffusing screen. It is fed from a transformer with dimming rheostat.



## DICK-WRIGHT OCULAR

The graduated rotating slotted ocular, M007570, which can be used with the photovisual head M720380, has been designed to enable the top portion containing the analyser, cross-wires, and slot for compensators, to be rotated with a circular scale graduated in degrees against a fixed vernier reading to 6 minutes of arc. It is fitted with a clamp and iris diaphragm. Selenium cell adaptor for photometric measurements is available on order.



## COMPENSATORS

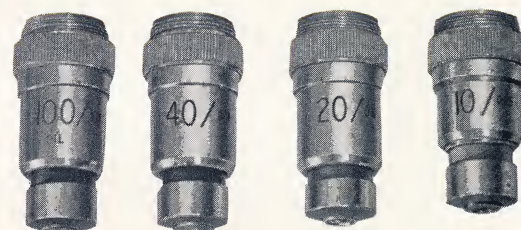
- M720335 Mica  $\frac{1}{4}$  wave plate.
- M720340 Nakamura  $\frac{1}{4}$  shadow plate.
- M720345 Elliptic  $\frac{1}{8}$  wave plate.
- M720350  $\frac{1}{4}$  wave and sensitive tint plate in single mount.
- M720365 de-Sénarmont plate (5461A).
- M720370 Elliptic and Nakamura plate in single mount.
- M720375 Sensitive tint plate.
- M007585 Quartz wedge—not graduated, 6 orders.
- M007590 Quartz wedge—graduated, 6 orders.
- M007572 Adaptor for any of the above compensators to Dick-Wright ocular.
- M007571 Wide graduated quartz wedge—6 orders for Dick-Wright ocular.



## ACHROMATIC OBJECTIVES

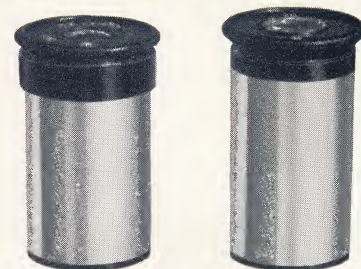
The range of achromatic objectives for polarizing microscopes extends from 3 $\times$  to 100 $\times$  oil immersion. They are all mounted with great care and then selected for strain-free properties. The lower powers up to 10 $\times$  can be used for transmitted or incident light work, but from 20 $\times$  upwards objectives must be corrected for use with or without a cover glass over the specimen, and if work with both covered and uncovered objects is to be done, two of each of the higher power objectives will be necessary, one for covered objects and one for uncovered objects.

Flat field achromatic objectives are available in powers 10 $\times$ , 20 $\times$  and 40 $\times$ .



## EYEPIECES

Eyepieces for polarized light microscopes have a cross-line in the field of view and a focusing adjustment to focus the crossline. The eyepieces are either normal tube 23.2 mm. diameter or the wide tube wide field type 29.2 mm. diameter. Monocular heads are made in both normal and wide tube. The binocular head is only made in the 23.2 mm. tube.



## CONDENSER

The Abbe condenser M720294 is usually favoured for polarizing microscopes as its simple construction provides a minimum of depolarizing problems. It is supplied in a plain mount.

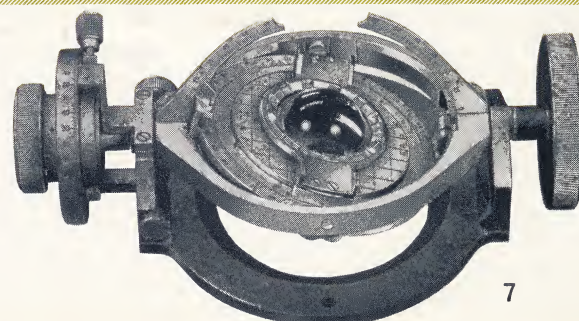
The swing-out top lens condenser M720495 is of the Abbe type and is supplied in a centring mount.

The aplanatic condenser M720475 in a centring mount is useful where a higher numerical aperture is required.







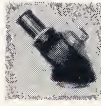



## THREE AXIS UNIVERSAL STAGE

The three axis universal stage M007745 is for the determination of the optical properties of crystals. The equipment includes a special 5 $\times$  objective N.A. 0.15 (N.A. 0.23 when the hemispheres are used) and a pair of glass hemispheres ( $n = 1.54$ ). A complete range of accessories is available.





## When ordering a polarizing microscope . . .

- |                                  |   |  |   |
|----------------------------------|---|--|---|
| 1. Choose the stand . . . . .    |  | 5. The mirror or illumination unit . . . |  |
| 2. The analyser . . . . .        |  | 6. Eyepieces . . . . .                   |  |
| 3. The viewing head . . . . .    |  | 7. Objectives . . . . .                  |  |
| 4. The polarizing unit . . . . . |  | 8. Condenser . . . . .                   |  |

See page 6 and enclosed price list for accessories.

### EYEPIECES

#### NORMAL TUBE

M045000	5×
M045300	10×
M045320	10× paired

#### WIDE TUBE

M045005	5×
M045305	10×
M045303	10× (with scale)

M022013  
M022113  
M022313  
M022413  
M022414  
M022513  
M022514  
M022913  
M022914  
M022613

POWER	N.A.
3×	.10
5×	.15
10×	.25
20×	.5
*20×	.5
40×	.65
*40×	.65
40×	.85
*40×	.85
100×	1.30

### ACHROMATIC OBJECTIVES

#### FLAT FIELD OBJECTIVES

	POWER	N.A.
M025113	10×	.25
M025114	*10×	.25
M025413	20×	.5
M025414	*20×	.5
M025213	40×	.7
M025214	*40×	.7

\* for uncovered objects.

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## COMPASS AND RULE

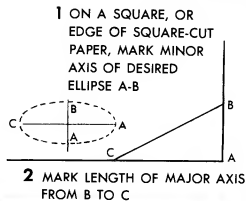
FOR  
INCH FRACTIONS  
USE HOLES LEFT  
OF ZERO AS  
CENTER

EXAMPLE:  
WITH BRAD AT  $\frac{5}{8}$ "  
PENCIL AT  $6$ "  
RADIUS IS  $6\frac{5}{8}$ "

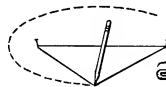
SWING PENCIL  
IN HOLE  
AT DESIRED  
RADIUS

FOR AN  
EVEN-INCH RADIUS,  
INSERT BRAD  
AT ZERO CENTER

## DRAWING ELLIPSES



3 DRIVE TWO BRADS  
DISTANCE A-C APART



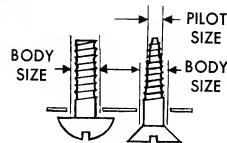
5 WITH LOOP ON BRADS,  
SWING PENCIL INSIDE IT  
TO DRAW ELLIPSE

4 TIE A LOOP  
EXACTLY HALF  
LENGTH OF  
A-C PLUS B-C

## TAP DRILL SIZES

TAP	DRILL NO.	DECIMAL SIZE	TAP	DRILL NO.	DECIMAL SIZE
4-36	44	.086"	$\frac{1}{4}$ "-20	7	.201"
4-40	43	.089"	$\frac{1}{4}$ "-28	3	.213"
5-40	38	.101"	$\frac{5}{16}$ "-18	F*	.257"
6-32	36	.106"	$\frac{5}{16}$ "-24	I*	.272"
6-40	33	.113"	* $\frac{1}{4}$ " drill may be used		
8-32	29	.136"	$\frac{3}{8}$ "-16	$\frac{5}{16}$ "	.312"
8-36	29	.136"	$\frac{3}{8}$ "-24	Q*	.332"
10-24*	25	.150"	* $\frac{2}{16}$ " drill may be used		
10-32*	21	.159"	$\frac{7}{16}$ "-20	$\frac{25}{64}$ "	.390"
			$\frac{1}{2}$ "-13	$\frac{27}{64}$ "	.422"
			$\frac{1}{2}$ "-20	$\frac{29}{64}$ "	.453"

## BOLT AND SCREW SIZES



FIND SMALLEST HOLE  
ABOVE SCREW DROPS  
INTO. DON'T FORCE.

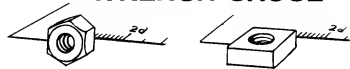
SCREW BODY NUMBER	BODY DRILLS		PILOT DRILLS	
	MACHINE SCREWS	WDD SCREWS	IN SOFT WOOD	IN HARD WOOD
4	No. 31	$\frac{1}{8}$ "	$\frac{1}{16}$ "	$\frac{5}{64}$ "
5	No. 29	$\frac{9}{64}$ "	$\frac{5}{64}$ "	$\frac{3}{32}$ "
6	No. 27	$\frac{9}{64}$ "	$\frac{5}{64}$ "	$\frac{3}{32}$ "
7	—	$\frac{5}{32}$ "	$\frac{3}{32}$ "	$\frac{7}{64}$ "
8	No. 18	$\frac{11}{64}$ "	$\frac{3}{32}$ "	$\frac{7}{64}$ "
9	—	$\frac{3}{16}$ "	$\frac{7}{64}$ "	$\frac{1}{8}$ "
10	No. 9	$\frac{3}{16}$ "	$\frac{7}{64}$ "	$\frac{1}{8}$ "
12	No. 2	$\frac{7}{32}$ "	$\frac{1}{8}$ "	$\frac{5}{32}$ "

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## 20-IN-1 SHOP GUIDE

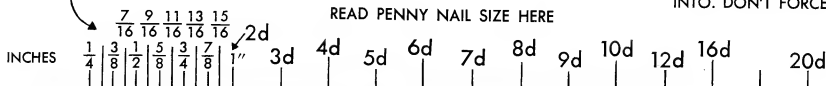
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BOLT-HEAD, NUT,  
WRENCH GAUGE

READ ACROSS-FLATS AND  
WRENCH SIZE HERE

PENNY-NAIL  
GAUGE

READ PENNY NAIL SIZE HERE



## SCREW THREADS PER INCH

32

28

24

20

18

16

14

13

MATCH THREADS  
TO LINES